our present knowledge. Signals and interlocking are efficiently dealt with in chapter v. Then the telegraphs are equally well described in chapter vi. The rolling-stock of a railway forms probably the most important part of the necessary plant, and is affected more than anything else by the gradually increasing speeds and weights of trains. Chapters vii. and viii. deal with this important subject. The standard types of locomotives are very well illustrated, but the descriptions might with advantage have been more detailed. The author discusses the necessity for an increase of power in the passenger locomotives to cope with the increased weight of the principal express trains, and the solution of the problem by the introduction of Mr. Webb's fine compound locomotives. The construction and working of these engines are described clearly enough for the benefit of non-professional readers. It would have been interesting to find an account of the Worsdell compound locomotive, which, although not in use on the North-Western, has many points in its favour. Comparing it with Mr. Webb's engine, many engineers consider it the better engine of the two. Perhaps in a future edition Mr. Findlay might add a description of it, with an illustration.

Carriages and different kinds of rolling-stock are well dealt with, and it is evident that the author has taken the utmost pains to get his information up to date. The locomotive works at Crewe, and the carriage and waggon works at Wolverton, are capitally described. With reference to the automatic vacuum brake, described on p. 120, it is evident that this brake is automatic on the coaches *as well as* on the guards' vans. As this is probably of recent introduction, the North-Western Company are to be congratulated on its adoption in their rolling-stock. The earlier vacuum brake fitted was nothing more than the simple non-automatic vacuum brake as far as the coaches were concerned, and was justly condemned by most railway engineers for that reason.

The remaining chapters deal with the working of the trains, shunting and marshalling of goods trains, the working of goods stations, rates, fares, traffic, &c. With regard to all these matters the writer's statements are clear, concise, and to the point.

It would be of great service to the railway world generally if some of the head officials of the best English railways would follow Mr. Findlay's example, and give us some of their stores of experience. Take, for instance, locomotive engineering: where is the student or apprentice to find a book of recent date on the design, construction, and working of the modern locomotive? Let us hope that the infection will spread on the North-Western staff, and that by and by Mr. F. W. Webb, the able Locomotive Superintendent of that railway, will write a book on the department in which he so greatly excels.

Mr. Findlay's book displays so much knowlege and ability that it well deserves to rank as a standard work on the subject.

N. J. L.

OUR BOOK SHELF.

Zur Geologie der Schweizeralpen. Von Dr. Carl Schmidt. One Plate. (Basel: Benno Schwabe, 1889.)

THIS pamphlet gives a summary of the views entertained at the present time by many leading Swiss geologists as to the geological history of the Alps. So far as we can see, it does not profess to be more than a compilation, or to contain any original work; but as a summary it is as clear and concise as the subject permits. The author, in the first chapter, briefly sketches the history of the principal types of rock which enter into the composition of the Alps; and, as might be expected at the present juncture, lays much stress upon the results of pressure. Some, indeed, may think that the present moment is rather inopportune for such a memoir as this; for the modifications due to pressure, especially in rocks already crystalline, are still the subject of so much controversy among geologists, that it is difficult to know what may be taken for granted; and there is a danger, if the writer be a disciple of the new school, of confusing the results of demonstration and of hypothesis. A quotation (translated) will indicate the author's point of view better than a general statement. After pointing out that two great rock groups exist in the Alps, one consisting of various granitoid rocks, gneisses, and crystalline schists, the other of limestones, sandstones, and other sediments, he proceeds —"In Switzerland the region which intervenes between the two zones is not very broad. The general strike of this intermediate zone is through Coire, Ilanz, the Greina Pass, Scopi, Airolo, Nufenen, the Rhone Valley, to Martigny, and so through the Val Ferret to the Little St. Bernard. The rocks of this intermediate zone are crystalline sediments, the age of which it is difficult to fix with precision. In the Grisons they have lately been claimed by Gümbel as Palæozoic, in the Valais they have been shown by Lory to be Triassic: that the same, from the Greina Pass to the Nufenen, are Jurassic, can be proved by fossils." This, however, begs the whole question. It has yet to be shown that the Swiss geologists have not confused together, as some maintain, two distinct rock groups, owing to their having mistaken (not for the first time) for crystalline schists, deposits which only simulate the latter, because they are locally composed almost entirely of their *débris*.

But, putting aside theoretical and controversial matters, the author's summary is generally clear. It would, we think, have been more useful if he had condensed somewhat the general discussion in the opening chapter, and dwelt more fully in the others on the many interesting questions of local physiography which are opened up by a study of the Alps. To this objection, however, an exception must be made in the case of the nagelflue, where Dr. Schmidt's remarks are very interesting. In certain of these great masses of conglomerate, pebbles of crystalline rocks are fairly common. These, he states, whether granites, gneisses, or crystalline schists, show no indications of the dynamic metamorphism which is exhibited by similar rocks in the adjoining chain of the Alps. From this observation, if confirmed by further research, it would result that the "schistosity," or secondary foliation, which is so marked a feature in most parts of the Alps, has resulted not from the post-Eocene but from the post-Miocene set of movements.

Die Entstehung der Arten durch räumliche Sonderung. Gesammelte Aufsätze von Moriz Wagner. Herausgegeben von Dr. med. Moriz Wagner. (Basel: Schwabe, 1889.)

OF later years, zoological literature has been significantly full of contributions, advocating now addition to, now subtraction from, the theory of "evolution by means of natural selection" formulated by Darwin—contributions, the chief characteristics of which are that they are mutually destructive, that they are, comparatively speaking, unsupported by any serious array of observed facts, and that none of them meet with more than a few adherents. We do not believe that truth is appreciably advanced by ingenious speculation of that nature; it is certainly in so far retarded that the energy thus expended would have been better applied in placing Darwin's con-

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clusions under severe and prolonged tests, such as those attempted in Fritz Müller's "Für Darwin," and in Weismann's study of the markings of Lepidopteran larvæ. As Semper pointed out long ago (and too much insistence cannot be laid upon it), the present need is not for fine-spun theory—we have theories galore—but for the judicious compilation of facts selected where the leverage will tell, facts which shall either upset or confirm—it matters not which—the theory of natural selection.

The book before us must be classed among the speculative works just mentioned; and the gist of the author's views may be gathered from the following paragraph, written in 1880 (p. 401):—"Every permanent new form (species or variety) commences with the isolation of individual emigrants, separated for a prolonged period from the habitat of some parent species which is in the stage of variability. The active factors in the process are: (1) adaptation of the immigrant colonists to the external conditions of the new habitat (nutrition, climate, soil-composition, competition); and (2) the impression and development of the individual characteristics of the first colonists upon and in their posterity by reason of the breeding between near kin. This formative process ceases as soon as, owing to rapid multiplication, the levelling and compensating effects of intercrossing make themselves felt, resulting in and maintaining that uniformity which characterizes every good species and permanent variety." Wagner's hypothesis exalts the importance of geographical isolation at the expense of natural selection, and thus approximates, both at starting-point and conclusion, to Mr. Gulick's recent theory of "divergent evolution through cumulative segregation" (Journ. Linnean Soc., vol. xx. p. 189), though in detail the respective courses taken by the two writers are by no means identical.[1]

Consisting of a reprint of articles published between 1868–86, mainly in *Kosmos*, *Das Ausland*, and the *Allgemeine Zeitung*, the matter of the book has been long before the public, and its conclusions have been attacked from time to time by Haeckel, Weismann, Oscar Schmidt, and others; a translation of the first, and perhaps the most important article, has appeared in London (Stanford, 1873): criticism of the theory in this place is therefore unnecessary. The present reprint is edited by Wagner's nephew and namesake, in accordance with a wish expressed some time before his death in 1887, and contains, besides the articles previously published, a biographical sketch by Dr. von Scherzer, and editorial introductions; while the last 127 pages are devoted to an attempt of the editor to build certain recent discoveries, such as those of the *Challenger*, into the original structure. It is hardly necessary to say that, being a close-printed German octavo of 667 pages, the book possesses no index.

Sylvan Folk. By John Watson. (London: T. Fisher Unwin, 1889.)

MR. WATSON expresses much contempt for what he calls "the dry bones of science." We are not sure that we quite understand what he means by this expression, but it evidently does not imply that he dislikes results obtained by careful and exact observation. In the present little volume he gives ample proof that he often brings himself face to face with Nature, and that he knows how to interpret many of the innumerable signs and symbols which are readily misunderstood, or altogether overlooked, by less careful inquirers. Mr. Watson is especially happy in his notes upon the ways of birds; but he has also interesting chapters on mice, voles, and shrews, on red deer, fallow, and roe, on British seals, on British fur-bearers, and on "Nature by night." There is not much that is absolutely new in any of the information he has brought together; but his descriptions are so fresh—they suggest so vividly the idea of happy hours spent among attractive scenes in the open air—that they will give genuine pleasure to everyone who reads them. The book will be especially interesting to young readers, who will be glad to learn that it depends very much upon themselves, according to Mr. Watson, whether they shall be on terms of intimacy with the wildest woodland creatures. Mr. Watson thinks that the power of attracting wild creatures was once a much more common possession than it is now.

A Practical Guide to the Climates and Weather of India, Ceylon, and Burmah, &c. By Henry F. Blanford, F.R.S. Pp. 369. (London: Macmillan and Co., 1889.)

THE appearance of this book is very opportune. The Indian Meteorological Office has been in existence for some twenty years, and inasmuch as the region over which its operations extend comprises a very considerable area of the earth's surface, representing climatological conditions of the most varied character, a general *résumé* of the information as to these conditions is one of the most important contributions to climatology that could be made.

Mr. Blanford has well fulfilled his task. He says his work "is not addressed to meteorologists and physicists, ... but more particularly to agriculturalists, medical officers, engineers, pilots and other seafaring men, and to those others of the general public to whom the weather and the climates of India and of its seas are practical and not scientific objects of interest."

The book is divided into two parts: (1) the elements of climate and weather; (2) the climates and weather in relation to health and industry.

The former is naturally the more technical, while the latter appeals to the general public, as it gives a detailed description of the climates of the principal and most frequented hill stations, as well as of the plains, under which latter general head the different provinces or districts receive each a separate notice.

One section is specially devoted to the storms of the Indian Seas. In their discussion Mr. Blanford is a pronounced adherent of the spiral in-draft theory in contradistinction to the old circular theory and the well-known "eight-point rule."

About the most valuable chapter is the last, which is mainly occupied with rainfall and evaporation. The questions relating to these are of paramount importance for the bare existence of millions of the population. Such a famine as that of 1834 in the Doab was sufficient to induce the authorities of the day to construct the Ganges Canal, the greatest work of the kind in the world, and one which has in a great measure corrected the injurious effects of irregularity in the rainfall.

The appendixes give the tabular results of the instrumental records, which are required to substantiate the general statements contained in the previous pages.

The work is a most creditable production, and it will long remain the standard authority on any question bearing on the climate of the Indian Peninsula.

The Unrivalled Atlas. Enlarged Edition (18th). (London and Edinburgh: W. and A. K. Johnston, 1889.)

A NEW and enlarged edition of this atlas has just been published. The forty maps which it contains are well engraved and especially full of information concerning railway communication, whilst the fact that the index contains 20,000 names of places, with their latitude and longitude, testifies to its completeness. An extension of the atlas has been made by the addition of two classical maps, with an index to them, two physical maps of the British Isles and Europe, and two astronomical plates, each being accompanied with descriptive letterpress. A misleading paragraph occurs in the explanation of tidal action. We read: "The moon exerts a much greater influence on the production of tides than the sun; for, though its mass is excessively small in proportion, it is four hundred times nearer the earth." The inference that

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